PM COST ESTIMATE TRANSPORT OF CARBON DIOXIDE (CO_2) FROM RENOVA AKV TO ENERGIHAMNEN BY ROAD

In the Cinfracap 2 project costs for a local infrastructure for CO_2 from Carbon Capture are being estimated. The estimates include costs for a pipeline for gaseous pressurized CO_2 from the Renova Site at Sävenäs in Göteborg to Energihamnen in the Port of Göteborg. An estimate of cost for transporting the CO_2 in a liquid and pressurized phase, by truck on public roads is needed for comparison. This PM summarizes such an estimate.

The estimate was made by a consultant[1], who is an expert in road logistics and cost estimates, situated in the Göteborg region. Costs include investments and running costs for trucks and trailers, taxes, labor costs etc as of prices, regulations and agreements "Kollektiv-avtal" in 2019-2020. The driving route is one allowed for liquefied CO_2, with a UN-number of UN1013 and is 30 km one way.

Investment cost per truck is 1.5 MSEK[2] and per trailer (holding 40m^3 a piece) is 3.5 MSEK. Assumptions used in the estimate are a depreciation period of 10 years, interest rate of 5 %, investments and fuel costs as in June 2020, Usage: 24 hours a day, weekends only daytime. The assumed transport fuel is HVO.

One trailer and tank are estimated to transport 88 000 tons CO_2/year at a cost of 6,84 MSEK, which yields a cost of close to 80 SEK/ton CO_2. 15 % of the costs are due to investment costs in truck and trailer, 35% in milage costs, 30% in labor including over-time, and 10 % is administrative costs. 10% is unknown or profit costs, for an external company if hired to do the job.

Costs for on-site liquefaction, intermediate storage tanks on-site and out-loading including stationary pumps, are not included in the estimate. Especially the liquefaction is likely to drive costs since the energy needed and the material demand for a pressurized tank may be significant. However, if liquefaction takes place at the Renova site, Renova will not have use of that service in the harbor and should not have to pay the equivalent costs there.

Table 1Estimated transportation costs Sävenäs-Energihamnen by road, excluding intermediate storage tanks, liquefaction and loading area

year	CO_2 (ton)	Trucks and trailers needed	Approx cost SEK/ton
	88 000	1	79
2030	160 000	2	79
2030 (if P7)	*100000*	*2*	*86*
2035	320 000	4	79
2040	500 000	6	79

[1] Mats Eriksson at Jan A Eriksson Åkeri AB
[2] MSEK is short for Million Swedish Crowns

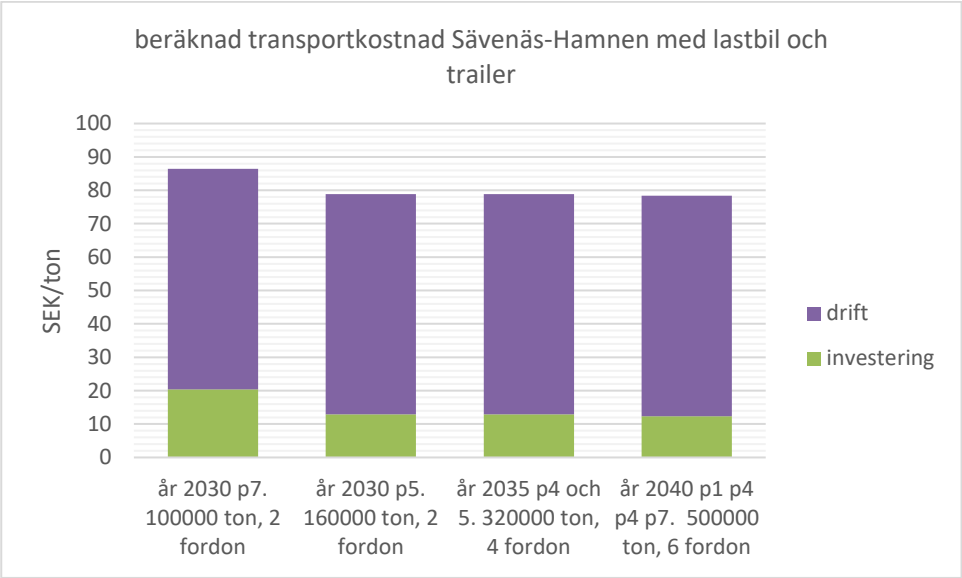

Figure 1 Estimated transportation costs in running costs and investment costs from Sävenäs to Energihamnen by road, excluding liquefaction, intermediate storage tanks and loading area

In the Cinfracap 2 project, estimates on the cost of a pipeline for gaseous CO_2 from Renova to the harbor have been made. A pipeline would cost 300 MSEK. If the depreciation period is set to 25 years, the cost would initially be approximately 160 SEK/ton for 160 000 tons/year[3], and probably higher if only 100 000 tons were to be transported. The cost will decrease with time as volumes rise to full capacity. No liquefaction on the Renova-site and less storing capacity would be needed if transported in pipeline

Conclusions:

The costs for intermediate transportation for captured CO_2 will be lower by road then by pipeline in 2030 when only CO_2 from one furnace will be captured and transported. With increasing amounts of CO_2 with time, transportation by pipeline may be the most cost-effective choice.

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[3] Draft summary Report Cinfracap WP5-business model, August 2022